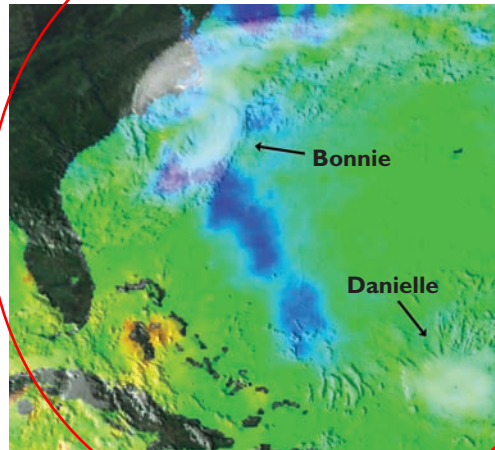


Contrasting images of the global ocean surface temperatures for December 1993, showing the normal situation, and December 1997, during an El Niño event. The most significant change between the two cases is that the warm temperatures, usually centered in the western Pacific, extend across the whole Tropical Pacific during the El Niño, and the usually cold waters off Peru, important to the local ecosystem, are missing. (Data from NOAA's AVHRR.)

terns of surface temperature are readily seen in the satellite imagery, which have shown the surface currents to be very variable, changing in strength and position in periods of weeks to months. Some of these changes, such as the meanders of the Gulf Stream, do not have a very significant impact on the weather, but others, such as the increase in surface temperature across the Tropical Pacific Ocean caused by the El Niño phenomenon, have serious consequences.

Destructive hurricanes, typhoons and cyclones grow over the warm seas, feeding on the heat available in the ocean, and satellite measurements of the sea surface temperatures are used to improve the forecasting of hurricane intensities and paths. However, an interesting example of the reverse happening, the decay of a hurricane, occurred with Hurricane Danielle in August 1998. A few days earlier Hurricane Bonnie intensified over the warm waters north of the Bahamas, and by extracting heat from the ocean reduced the surface temperature, leaving a cold wake in her path. As Hurricane Danielle encountered this cool pool of sur-



The cold wake produced by Hurricane Bonnie from August 24-26, 1998. Hurricane Bonnie is approaching the Carolina Coast and Hurricane Danielle is following roughly in its path. Bonnie left a cooler trail of water in its wake, causing Danielle's wind speeds to drop markedly; however, when Danielle left Bonnie's wake, its wind speeds increased due to energy supplied by warmer surface water. Dark blues represent temperatures around 24°C (75°F), greens 29°C (84°F), and yellows 32°C (90°F). (Image from the TRMM Project, Remote Sensing Systems, and NASA/GSFC Scientific Visualization Studio)